

and their position thereon. The proofs here given should serve to elucidate some of the puzzling cases not infrequently met with in testing errors of refraction. Chapter x., again, gives much valuable information on the use of the ophthalmoscope to the best advantage, and the difficulties of retinoscopy are sufficiently dealt with in the last chapter. There is no mention of accommodation or presbyopia, several points in which might well have been touched upon. An index would have been of assistance in the search for any equation relating to a particular case.

The Process Year Book, 1901-2. Edited by William Gamble. Pp. xvi+152. (London: A. W. Penrose and Co., 1901.)

EVERY year we receive this admirable and beautiful book illustrating the present state of process work, and we cannot do better than again suggest that everyone interested in the art of picture reproduction should be the possessor of this volume. The illustrations and text still maintain their high standard of excellence, and the variety of the subjects and processes dealt with gives the reader a good insight into the manifold methods in photo-mechanical engraving and the allied arts and crafts.

It may, perhaps, be specially mentioned that in consequence of the great advance in the department of process work relating to the three-colour method the editor has introduced a variety of specimens such as perhaps never before has been collected together between the covers of a single book. A glance at these soon suffices to illustrate the high state of efficiency of the methods employed to-day; and one only wonders what the future has in store for us, since it is to this branch of process work that we look for the possibility of the greatest progress.

Nautical Astronomy. By J. H. Colvin, B.A. Pp. 127. (London: E. and F. N. Spon, Ltd., 1901.) Price 2s. 6d. net.

ONE of the greatest difficulties encountered in the study of spherical and nautical astronomy is to obtain a proper comprehension of the various circles of the celestial sphere, without which the solution of the problems involved can never be anything more than mechanical. The author of this book, however, has not thought it necessary to assist the student greatly in this direction, for fifty very brief definitions can by no means be regarded as an adequate introduction to celestial geometry. Thus, unless the student is endowed with an exceptionally good geometrical imagination, or has the advantage of a good teacher, it does not seem likely that he will be able to use the book with profit. The initial difficulties excepted, however, the book has many good features; the explanatory matter is brief and clear, and there is a useful collection of formulæ, rules, numerical illustrations and exercises to be worked out. Much space is saved by the omission of tables which do not vary, while specimen pages of the "Nautical Almanac," adapted to the exercises, have been introduced.

The book is designed to cover the elementary and advanced stages of the South Kensington syllabus, and also includes the course for "extra master" in the Board of Trade examination.

Elementary Chemical Theory. By G. H. Martin, M.A., F.C.S. Pp. 24. (London: Rivingtons, 1902.) Price 9d.

THE only use to which this collection of didactic statements can be put is to furnish students of chemistry with material suitable for copying into their notebooks. It was scarcely worth while to attempt to extend the use of the book beyond the author's own pupils.

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LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. No notice is taken of anonymous communications.]

Cherry Disease.

IN NATURE for January 9 (p. 239) there is a report of the meeting of the Royal Microscopical Society on December 18. The president, Mr. William Carruthers, F.R.S., made a communication with respect to the cherry disease which has appeared in Kent, from which I extract the following:—

"The results of experiments in the cultivation of the fungus showed it to be one which belonged to the genus *Gnomonia*. Many of the fungi in this class passed through various stages in their life-history, for example the mildew on wheat, which was first developed on the berberry and then spread to the wheat, appearing first as rust and afterwards as mildew from the same mycelium. The president referred to the absence in this country of any authority competent to investigate cases such as this; on the continent, however, the Governments had taken up the matter, and the experts who had inquired into it had found that to check the spread of the disease it was necessary to collect all the dead leaves and burn them."

Prof. A. W. Bennett followed in the same strain and "enlarged upon the absence in this country of investigations into such matters by State-paid establishments, and described what was being done in the United States, where every State had its own experimental station."

Now it is not my intention to discuss whether the Government does as much for scientific inquiry in the interests of the community as it might do. But it is clear to me that nothing is gained by overstating the case. There are two "State-paid" establishments devoted to botany in this country, Kew and the Botanical Department of the British Museum. Each happens to have upon its staff an officer trained in mycological investigation. And it may be added that Mr. Carruthers is himself consulting botanist to the Royal Agricultural Society.

So far as Kew is concerned, the matter was promptly dealt with in ordinary routine. Mr. Massee, who has charge of the cryptogamic collections, had given a brief account of the disease in his "Text-book of Plant Diseases," with a figure (pp. 110, 111), although at the time (1899), so far as I am aware, the disease had not been noticed in this country. Mr. A. O. Walker, of Maidstone, sent specimens in November, 1900. I quote the *Gardeners' Chronicle* for May 23, 1901 (p. 191), where he writes:—

"Early in November I sent specimens to Mr. G. Massee, of the Kew Herbarium, who reported to me that the leaves were affected by the fungus *Gnomonia erythrostoma*, and quoted Frank's opinion that the leaves should be gathered and burnt."

The council of the Royal Agricultural Society issued on February 6, 1901, a report by Mr. Carruthers giving the history of the disease and recommending Frank's remedy of burning the leaves. There is nothing very profound in this recommendation, as it is a general method applicable to all plant diseases propagated by spores, and aims at removing the source of infection.

As I recently pointed out in NATURE (vol. lxiv. p. 212), we owe to the late Prof. Cornu "the principle now so familiar as to seem almost obvious, of preventive treatment by the careful destruction by burning of the *débris* of plants which may harbour spores."

I may add that the *Gnomonia* is well known to mycologists, having, in fact, been first described by Persoon as a *Sphaeria* a century ago, and there are in the Kew Herbarium specimens of it from no less than eight published collections. Mr. Carruthers in his report, which is reproduced in the *Journal* of the Royal Horticultural Society (n.s. xxv. pp. 313-316), does not give an illustration of the *Gnomonia*, but figures instead a "Fragment of Leaf of Cherry Tree showing groups of Parasitic Fungi." These belong, apparently, to a species of *Phoma* and, so far as I am aware, there is no evidence that they have anything to do with the *Gnomonia*.

There the matter stands, and for my part I entirely fail to see how "the authority competent to investigate cases such as this" of whom we are said to be in want, could carry it farther. The

disease has been known on the continent for the last twenty years, and notwithstanding that "Governments had taken up the matter," we are no wiser as to the life-history of the parasite than they were in Germany at starting. Nor if we were should we be probably any better off, however interesting the result might be from a scientific point of view. For each phase of such a fungus has apparently an indefinite capacity for propagating itself independently. The rust of wheat is as destructive in Australia as anywhere else, and is not checked by being unable to complete its life-history on the barberry.

It is not material, but it may be noted that *Gnomonia* belongs to a group of fungi widely remote from the rust of wheat. I can hardly believe that Mr. Carruthers intended to suggest that they belonged to the same "class."

But my object in drawing attention to the matter is to remonstrate with my scientific friends for the mistaken policy which it seems to me that many of them are too apt to adopt in matters of this kind. It is the fashion now to clamour for "State-paid" assistance for everything, with no sense of the relative importance of the objects aimed at or appreciation of the work which is actually being done. It is most important that Government aid should be obtained for a definite purpose, such as that of the National Physical Laboratory. But if scientific men will not even give the Government credit for the aid it gives, they run the risk of being regarded as impossible to satisfy.

In his report, published by the Royal Agricultural and Horticultural Societies, Mr. Carruthers states:—"The neglect of undertaking this operation (burning of the dead leaves), though costly, means the disappearance of the cherry orchards of Kent in a very few years." In the face of this very serious statement it is remarkable that, so far as I can ascertain, no information on the subject has reached the Board of Agriculture.

Kew, January 22. W. T. THISELTON-DYER.

Variation in Fowls.

EVERYONE who is acquainted with poultry must join Mr. Tegetmeier in deprecating the economic degradation of good old breeds by breeding for fancy points only (p. 152). But it is an ill wind that blows nobody good, and from a scientific point of view a decadent old breed with exaggerated points is more interesting than one of the comparatively useful modern mongrels produced by crossing, since the former shows conclusively what can be done by sheer selection, even though applied for a senseless end.

Fortunately, Mr. Tegetmeier has given excellent comparative views of some breeds before and after "improvement" in his work on "Table and Market Poultry"; but if the old strains are obtainable anywhere in their primitive form it would be, I think, very desirable to get specimens and preserve them, together with some modern highly-bred birds, for the benefit of bionomical students when the declining breeds have become extinct. Meanwhile, I should like to draw the attention of students of variation to the great differences observable in domestic fowls which have not been subjected to any selection, such as the ordinary poultry of India. Among these, although they are allowed to breed anyhow, may be seen all recognised colours of fowls except those of the highly specialised laced, pencilled and spangled breeds, which have needed a long course of selection. Double or "rose" as well as single combs occur, although the latter are a minority, and small crests are common. Five toes and feathered legs are rare; the legs vary much in tint.

Now, in Egypt, I have observed that, while equally variable in coloration, the fowls displayed some structural points peculiarly their own. The combs are very often *really* double; not the coral-like "rose" comb, but a bifid or two-flapped edition of the normal compressed and serrated form. The hind toe also was very often bifid, exhibiting every gradation from the five distinct toes of the Dorking to a distally split hind toe or one in which the normal hallux was represented by a mere terminal joint with a nail, growing from the long upper supernumerary hallux. Indeed, I even got a specimen in which the extra hallux alone remained, the true first digit having disappeared altogether! The consequence was that this bird's foot looked like a curassow's, but I observed that it had very little power of grasping therewith.

In Zanzibar I again found poultry of every colour, but very true to the lanky, close-feathered, small-combed Malay or

Chittagong type, which thus seems to maintain itself in spite of neglect by breeders.

What is particularly noticeable in casually-bred poultry is the correctness of some of the types of marking. Thus the silver-grey variation, in the cock, resembles the typical black-breasted red in everything except in that the red parts of the plumage are changed to white. The corresponding hen has the brown and yellow of the upper surface also replaced by white, and hence is grey in tone with a silver-streaked hackle.

When such correlated grey and rufous forms occur in wild gallinaceous birds, they are put down as climatic variations, but it is obvious that climate cannot be the *direct* cause, though it may favour the survival of one type rather than the other, according to constitution or surroundings.

Another common style of marking found in two colours is that in which the base of the neck, the primary quills and the tail are chiefly black in both sexes, the rest of the body being uniform, either white or some rufous shade ranging from bay to buff. This coloration might easily characterise a natural species, although it is not known to do so; in accepted breeds the white form has been adopted as the proper colour for the light brahma, and the cock of the golden-pencilled Hamburg breed closely approximates to the black-tailed rufous form. Hens of the black-tailed red type are, however, not recognised in any breed.

A very common and curious variation in rough-bred fowls is the "wheaten" hen. This bird is of the pale-brown colour of wheat, with a dark-brown neck and black tail; but the correlated cock is a black-breasted red of the jungle-fowl colour. This colour of the hen is recognised in Malays and old English game, and is said to breed the brightest cocks.

It has occurred to me that the occurrence of two such distinct types of hens as the "wheaten" and the "partridge" (the name given to hens of the jungle-fowl brown) in correlation with similarly coloured cocks may, perhaps, help to explain the phenomenon of dimorphism in female butterflies. For if we knew the pedigree of these insects as well as fanciers do that of their fowls we might very possibly find that in dimorphic species two strains with dissimilar females but similar males existed and interbred.

So, also, the great and sudden variations throw light on the origin of mimicry. The form of the fowl with white body and black quills and tail, above alluded to, is similar in plan of coloration to several large and powerful birds. If such a variation occurred where the form and flight were favourable to mimicry, as it might easily do among the multitudes of passerine birds, we should have mimics ready-made.

The problem in the case of butterflies is much easier, owing to their greater general similarity of shape; but in any case it is obvious that variation is more important than selection here.

Indian Museum, Calcutta.

F. FINN.

Elementary School Mathematics.

THE appointment of a committee of the British Association on the teaching of elementary mathematics encourages the hope that that body will be able, after collecting the opinions of practical educators, to focus them with due wisdom into a scheme which will be generally acceptable, both to teachers and examiners. For success to be attained it is obviously necessary that those who are in actual touch with the work of teaching should state what, in their judgment, is desirable and practicable. Hoping that others besides myself will follow the example set some time ago by Mr. Hurst of Eton, I venture to write to NATURE a sketch of the conclusions to which an experience of many years at Charterhouse has led me.

I have in mind in what follows the needs of the average boy, not of that comparatively rare individual who has some real mathematical taste; but I am sure that the progress of the latter is at present often sadly retarded by the course of study through which he is put. Our public schools have, unhappily, as I think, no organisation for securing common action except the annual conference of head-masters, which has, so far, done very little for the cause of education, hence methods and ideals vary much; but I shall assume that the average character of what is taught may be gathered from the papers set in the various public examinations for which we all prepare, and from the most popular text-books in use. Taking this ground, I think the broad indictment must be at once admitted that school mathematics are altogether too abstract and